Adjustable bulk bag filler offers the answer at Anchor Products

Anchor Products is the largest business unit of the New Zealand Dairy Board. It operates 11 manufacturing sites on New Zealand's North Island and South Island. Its butter, cheese, and milk-powder factories are some of the biggest in the world.

The company processes about 58 percent of all milk produced in New Zealand and exports 90 percent of it. To ensure products are tailored to the requirements of end-users, Anchor Products maintains close relationships with its overseas customers. As a result, the company enjoys the position of preferred supplier to a wide range of international companies.

Request from Korea
In 1999, Anchor Products learned that a competitor had approached one of its customers in South Korea with an offer to supply sodium caseinate in bulk bags. Sodium caseinate, a dry powder, is a milk protein that the Korean customer uses to make coffee creamer. At the time, Anchor was supplying the customer with sodium caseinate in 20-kilogram multiple-wall paper valve bags.

"The customer gave us notice that they would no longer take 20-kilogram bags," said Keith Mason, who was site engineering manager at the Reporoa production facility that supplies the sodium caseinate. "There were health and safety issues and [the customer] didn't want to dispose of the paper [bags]." Mason said. But the customer could not specify what size bulk bag it wanted because its bulk-handling plans were still in the works. Nonetheless, the deadline for supplying the customer with bulk bags was firm, and it was approaching fast, so Mason sent out a request for proposals to equipment suppliers.

The bulk bag filler has a cantilevered filling head with powered height adjustment. It also includes a bag-inflating device and automatic densification. Bag hooks retract pneumatically.
Flexibility is key

“We didn’t know yet what size bag we were going to use. Probably, it would be between 350 and 750 kilograms,” Mason said. Such a large range of weights meant that the bag height could vary by 700 millimeters, he said. Several suppliers presented their bulk bag fillers, but only one offered a machine that could handle different bulk bag sizes. That supplier was Fresco Systems, a licensee of Flexicon of Phillipsburg, NJ USA.

In addition to an adjustable bulk bag filler, the supplier proposed a system of flexible screw conveyors to link the supply bins to the bulk bag filler. The conveyors saved precious space—the packing room is only 10 meters by 7 meters—and they eliminated the need for the blowers, filters, and other equipment related to pneumatic conveyors. “That was an important consideration,” Mason said. “Using a pneumatic conveyor would have required us to keep [the powder] in storage to de-aerate it. It would have been a 24-hour hold time.” The supplier also promised that the filling system would reduce the amount of dust compared with the rotary packer that filled the 20- and 25-kilogram bags.

Because of the Korean customer’s deadline for receiving bulk bags, Anchor had to install and operate the bulk bag filling system 10 weeks from the date it placed the order, in November 1999. And by necessity, production and packaging of sodium caseinate continued during that period.

“It was a struggle,” Mason said. He credited New Zealand’s B.W. Murdoch Engineers for their expertise in building the compact hygienic packing room quickly and for installing the equipment. “They did the coordination of packing schedules, provided notice so that production stayed on track,” Mason said. “Because of their experience in the dairy industry, they knew what was required.” He also had kind words for the US-based equipment manufacturer. “The gear itself is engineered very well. It’s all stainless steel, unbreakable type stuff,” he said. “It’s an impressive piece of work.” The project was completed a day ahead of schedule in January 2000.

A flexible screw conveyor (top) transports sodium caseinate powder through a discharge adapter to an automatic bulk bag filler. A controller (right) connected to four load cells ensures accuracy. An inflatable seal between the filler and the bag spout minimizes dust.
System setup

The sodium caseinate powder enters the packing room from the blending area after being spray dried and milled to the correct particle size. It then moves to a packing bin as a weighed batch according to the order requirement. At a control panel outside the packing room, a worker directs the powder to either the four-station rotary packing machine or to the bulk bag filler.

Two flexible screw conveyors take over from there. The first conveyor is 7 meters long and links the packing bin to a 1,500-liter surge hopper. The second conveyor links the surge hopper to the bulk bag filler at a lower level. Both operate at a 20-degree angle and use little force to move the powder, which is semi-free flowing. The low energy input prevents the sodium caseinate from aeroating. In addition, the conveying screws are flat spirals that offer a wider carrying surface than typical round-wire screws. The flat screws force the powder forward while minimizing the radial force against the outer tube. Furthermore, as the flexible screws rotate in the tube, they self-center, providing clearance between the screw and the tube wall.

“It’s the first time I’ve used this type of conveyor,” Mason said. “[The conveyors] were a good solution. They allowed us to put in a bend to account for a 60-centimeter misalignment to get the correct height.”

Initially, however, Mason had a couple concerns. The first was product degradation from the mechanical action of the screw. The second was abrasive wear of the outer tube. In fact, he said, product degradation has not been a problem, and he is counting on polymer wear linings to protect the outer tube from wear. “Time will tell,” he said.

Getting underway

Once a worker selects the filling sequence, operation becomes automatic thanks to a programmable logic controller (PLC). It is connected to level and weight sensors and to other process areas within the plant. It directs and monitors the entire bulk bagging operation, automatically filling the bag to the preset weight. (After testing and discussion with the South Korean customer, Mason determined that 600 kilograms was the ideal weight for storage and shipment in cargo containers.)

The bulk bag filler itself uses four load cells to monitor the weight and accuracy is good, Mason said. In fact, there is no check weight to verify accuracy. “That was a little unusual,” he noted, “because this is a high-value product. But we’re within 300 grams on a bag that weighs 600 kilograms. That’s a fairly good savings compared with our 20-kilogram bags. We were filling those to 20.020 [kilograms],” he said. At a production rate of 8 metric tons per hour, the savings add up fast. A vibratory device densifies the bulk bag as it fills without affecting weight accuracy.

An inflatable connector seals the bag spout to the filler during filling and, as promised, the bulk bag filler reduced dust compared with the rotary packer. “Previously we were recovering upwards of 0.05 percent of dust per day while packing 20-kilogram bags. This has dropped to 0.005 percent,” Mason said.

In the final steps, pneumatically actuated bag strap hooks release the filled bag; the PLC instructs the printer to print labels; and a flat-belt conveyor transfers the bulk bag to a heat-sealer. The bags can then be stacked up to three high in storage. Said Mason: “It was the third or fourth packing line I’ve done, and this was the best commissioning of them all.”

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